ESSAI

Volume 1 Article 36

Spring 2003

Foraging Behavior of Rodent and Songbird Populations, Examined with Variation of Predatory Risk

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by Abe Whiting

(Biology 103)

The Assignment: Write a research paper on a field-based ecological/behavioral study that shows how variations in the natural environment may differentially affect the foraging behavior of wild rodents and birds.

ABSTRACT

Foraging behaviors of rodent and bird populations of an Illinois prairie were compared. Predation risk was taken in, as a factor by leaving seed trays in two different microhabitat patches of the prairie. One was open burned terrain; the other thick, cover tall grass. Seeds were weighted aforehand and GUD's were measured once the trays were recollected. Both populations of nocturnal rodents and diurnal birds felt the pressures of implied predation strong enough to show a marked preference for the covered feeding patch. The ability of flight in birds did not seem to affect the preference for covered foraging. Future use of similar experiments may be useful in choice of habitat for the reintroduction of endangered species.

INTRODUCTION

The foraging behavior of birds and rodents should be directly related to the area and the time of day in which food is placed. This direct ration should come from various risks of the landscape including predation. "A formal definition of the cost of predation involves three terms: the risk of predation … the cost of being killed, which is the expected fitness if surviving … and the rate of change in expected fitness with energy intake." (Olsson et al. 2001) The cost of predation and the risk of predation are separate entities. The cost is shown in the GUD's, or giving up densities. Simply put, the amount of food left (given up) behind is the price paid because of predators. The risk is to the life of the forager being in immediate danger due to predation. Lastly, the rate of change in expected fitness with energy intake is simply the health of the animal compared with the amount of food it consumes or caches. Each species sees and perceives these risks differently. This leads to differences in feeding patch selections among species. (Marin et al. 2002)

In an experiment of the risk sensitivity in the foraging behavior of starlings, it was found that they always showed consistent variation in returning to food patch sites as to not reveal a pattern in which a predator could use to its advantage. (Schuck-Paim et al. 2001) This behavior is consistent with the point of this experiment. By spreading food in different zones of covered and uncovered areas, the belief is that birds and rodents will forage more readily within areas of better predation protection (e.g. under vegetation cover for rodents).

Being of different species and feeling different predatory pressures, birds will also have a higher likelihood to feed off of more tray that are in less covered areas, due to the adapted advantage of flight.

METHODS

The experiment took place on the Russell R. Kirt prairie located on the College of DuPage campus, Glen Ellyn, Illinois. The Kirt Prairie is an on-going restoration project initiated in 1984. It was built upon gravel and rubble with a majority clay base and only a thin layer of topsoil. It was reseeded and planted with seedlings that were a mixture of native grasses and forbs. Half the tall grass portion of the prairie is alternately burned every other year. This fact came greatly to our advantage in the experiment. The aim was to measure the average foraging of birds and rodents, in the face of predation.

Two types of patches were used. One patch was part of the prairie that had just been burned, and therefore was completely open. The second patch consisted of dense, dry, native tall grass remaining from the previous year.

The experiment was done in early spring so the primary species we were dealing with were: Peromyscus leucopus; common, white-footed mouse, Microtus pennsylvanicus; common, Meadow Vole, Common House Sparrow (non-native), European Starling (non-native) and the American Goldfinch; which is native to the prairie. The rodents from the area happen to be in majority nocturnal feeders; whereas the bird species above have a tendency to be diurnal feeders.

Four groupings of seed trays were constructed. Each group consisted of 40 trays. Each tray consisted of an average petri dish filled with 5 grams of sunflower seeds, and 25 mL of fine sand, to add to the effect of foraging. One group of trays was placed randomly throughout the unburned section of land at dusk; another was placed in the burned, open area, also at dusk. All trays were left with their lids off. They were staked to the ground to prevent tipping and bias data. All trays were also flagged, numbered and labeled for easy retrieval the next morning. The same procedure was followed for the other two groups, which were placed at dawn and were retrieved at dusk. Upon collection all trays were re-covered and rubber banded shut to keep from spillage.

Once back in the lab seeds were sifted from sand and weighted for GUD's. Each tray's GUD was recorded along with which group the tray belonged to. By knowing when the animal types feed we can fairly accurately assume what was eating from each tray, and whether that type of animal preferred to feed in the covered or uncovered environment.

RESULTS

Figure 1 shows the four groupings of 40 trays. The blue line represents the primarily nocturnal feeders eating from the covered grassland patch. This graph shows a multitude of spikes in the range of 3 to 4 grams of food consumed. The blue graph (R+B;COV)* being as dramatic as it is suggests a more relaxed attitude toward foraging in a double, predation protected environment; darkness and grassland cover. Similarly, this need for cover is represented in the yellow graph (B;COV). The only difference is that the creatures represented here are primarily diurnal. The orange (R+B;NOCOV) and green graphs (B;NOCOV), representing the burned, uncovered patch, show little to no activity by comparison.

*(R=rodent, B=bird, COV=cover, NOCOV=no cover)

This data is further compounded through statistical t=Test analysis (Table 1). If the Hypothesized Mean Difference of 0 were true, the fluctuation between COV (covered) and NOCOV (non-covered) would hover very closely to zero indicating very little difference between foraging behaviors for each microhabitat. However, as seen represented by tails 1 vs. 2, our fluctuation is far beyond any standard deviational error. This disproving of the Hypothesized Mean Difference of 0 indicates that animal foraging is greatly affected by placement of food stores.

DISCUSSION

The data gathered has shown that the risk of predation is very real to the populations of prairie foraging animals. The instinct of self-preservation likely has created a habituated gap between areas deemed safe to forage and those with a higher probability for failure. This coincides perfectly with the original hypothesis of cover creating greater foraging success. However, the subhyothese of birds feeling less predation pressure due to the adaptation of flight was quite disproved. Rodents consumed a greater quantity of uncovered food than did birds. (See Figure 1, R+B;NOCV vs. B;NOCOV) Even though unexpected, the variable of cover of darkness may be part of the reason for such an influx.

This was a relatively simple study of the effects of predation on foraging behavior. All the species studied are fairly common. There is great knowledge in such a small study. With more and more

animals getting their names added to the endangered species list, humans have to take a larger hand in repopulation of certain species. The simple information gleaned from this project gives greater insight into higher levels of environmental compatibility. The more a species is comfortable with its environmental specifics the greater its chance to survive, especially when it comes to something as touchy as reintroduction of an endangered species. Any edge that can be given in such instances is beneficial for all of us in the long run; even if it's just a little extra grassy cover.

Works Cited

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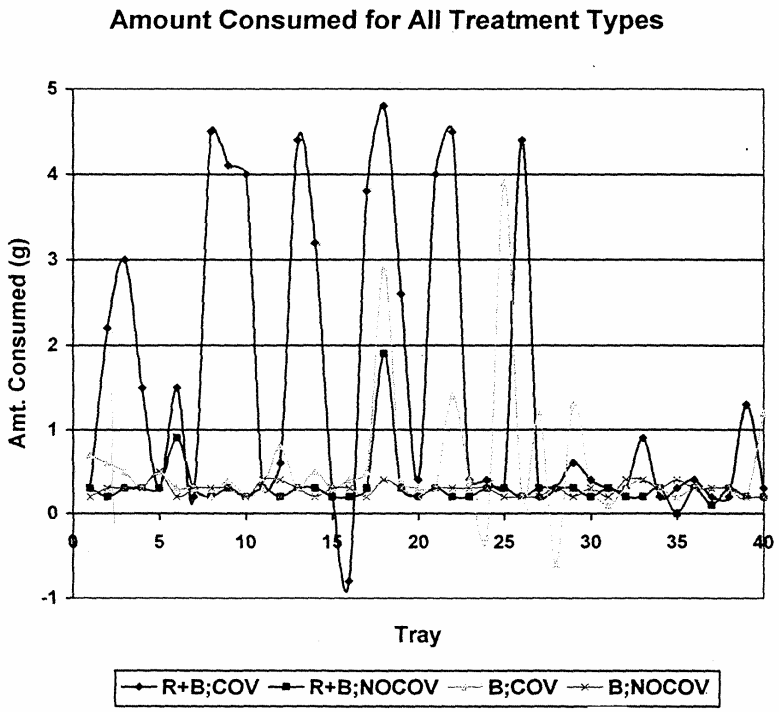

Figure 1

Table 1: Covered vs. Uncovered Consumption of seeds by _____ in microhabitats
t-Test: Two Sample Assuming Unequal Variances

	COV	*NOCOV*
Mean	1.04375	0.29625
Variance	1.959707278	0.043403481
Observations	80	80
Hypothesized Mean Difference	0	
df	82	
t Stat	4.723932775	
P(T<=t) one-tail	0	
t Critical one-tail	1.663647708	
P(T<=t) two-tail	0	
t Critical two-tail	1.989319571	